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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Shih-Jong J. Lee

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SHIH-JONG J. LEE
15418 SE 53RD PLACE
BELLEVUE, WA 98006

EXAMINER

MOHR, ERIC JOHN

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/767,530	Applicant(s) LEE ET AL.	
	Examiner Eric J. Mohr	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 February 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 6-8, 11, 12 and 14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 6-8, 11, 12 and 14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 February 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Amendment

1. Applicants' response to the last office action, filed February 11, 2008 has been entered and made of record.
2. In view of the amendments, the examiner expressly withdraws the objections to:
 - a. the drawings, specifically figure 5E.
 - b. minor informalities in the specification.
 - c. the application title.
 - d. the application abstract.
3. Applicants' amendment requires new grounds of rejection, which are presented in this office action.
4. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Braspenning et al., US 6,963,664 (hereinafter "Braspenning") in view of Richards, "Calculation of Molecular Volumes and Areas for Structures of Known Geometry" (hereinafter "Richards").

Regarding claim 6, Braspenning discloses an adaptive image region partition method (**see abstract**) comprises the steps of: a) Input a component labeled image (**column 4, line 66 to column 5, line 4: an image labeled with seed values**); b) Perform an adaptive two pass ZOI creation method using the component labeled image to create an adaptive ZOI image (**C5, L35-54: a two-pass algorithm to define the image regions closest to each seed point**).

Braspenning does not explicitly disclose an associated characteristics for each component or applying a distance metric depending on these characteristics. Richards discloses a method of partitioning an image into multiple regions each containing one component (atom) in an adaptive manner (**pages 445-450**) using attributes associated with each atom, these attributes including a distance metric (atomic radius) (**P441**).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Braspenning, and modify the partitioning process to use attributes of each component, as taught by Richards, thus overcoming prior limitations in the art which treat all components as equal in size, as discussed by Richards (**P449**).

Regarding claim 8, Braspenning and Richards disclose that the adaptive two pass ZOI creation step comprises the steps of: a) Perform a first pass scan using the component labeled image and component characteristics to create a first pass intermediate adaptive distance image and an adaptive shortest distance component label image wherein the adaptive distance image (**Braspenning C5, L39-42**) having distance metric depending on component characteristics (**Richards P449**); b) Perform a second pass scan using the first pass intermediate adaptive distance image and the

adaptive shortest distance component label image to create an adaptive distance transform image and an updated adaptive shortest distance component label image **(Braspenning C5, L42-44)** wherein the adaptive distance transform image having distance metric depending on component characteristics **(Richards P449)**.

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Braspenning and Richards as applied to claim 12 above, and further in view of Hansen et al., US 6,658,143 (hereinafter "Hansen").

Regarding claim 7, Braspenning and Richards discloses inputting a component labeled image and its associated characteristics for each component comprises the steps of: a) Input an input image **(Braspenning C6, L25-28)**; b) Perform component labeling using the input image to create the component labeled image **(Braspenning C4, L17-65: the process of labeling a digital image with seed pixels defining distinct regions)**. Richards uses component attributes **(P441)**, but does not explicitly disclose extracting these attributes from the image. Hansen disclose extracting component characteristics, including component size **(C13, L59-66)**.

Hansen determines cell characteristic in a digital image **(C1, L44-52)**, hence it would have been obvious to one skilled in the art at the time of invention to combine Hansen with Braspenning, allowing component attributes to be extracted prior to image partitioning, since Braspenning operates upon digital images.

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cong et al., US 6,956,961 (hereinafter "Cong") in view of Braspenning.

Regarding claim 11, Cong discloses a cell segmentation method comprises the steps of: a) Input a nuclei mask image **(C8, L43-48)** and its component labeled image **(C8, L41-56: the nuclei mask creation labels each region discretely)**; b) Input a cell mask image **(C9, L45 to C10, L30: the process for creating a cell shape-indicative marker)**; c) Perform nuclei region partition using the nuclei mask component labeled image and a ZOI creation method to create nuclei mask ZOI **(C10, L61-67: a watershed algorithm is applied to a nuclei mask image to determine cell boundaries)**; d) Perform cell region separation using the cell masks and the nuclei mask ZOI to generate cell separated regions wherein the cell mask having the same component label in the nuclei mask ZOIs is considered as one cell region **(C11, L8-17 describing the use of a watershed algorithm using both the cell mask and nuclei mask to determine cell boundaries)**.

Cong does not explicitly disclose creating the nuclear region partition in two passes. Braspenning discloses a method of segmenting a digital image by performing two passes over the pixels **(C5, L36-45)**.

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Cong, and perform the segmentation in a two step process, as taught by Braspenning, thus achieving segmentation with relatively limited calculation resources, as discussed by Braspenning **(48-50)**.

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cong in view of Richards.

Regarding claim 12, Cong discloses an adaptive cell segmentation method comprises the steps of: a) Input a nuclei mask image (**C8, L43-48**); b) Input a cell mask image, including a component label (**C9, L45 to C10, L30: the process for creating a cell shape-indicative marker; C8, L41-56: the nuclei mask creation labels each region discretely**); c) Perform adaptive nuclei region partition using the nuclei mask component labeled image to create adaptive nuclei mask ZOI (**C10, L61-67: a watershed algorithm is applied to a nuclei mask image to determine cell boundaries**); d) Perform adaptive cell region separation using the cell masks and the adaptive nuclei mask ZOI to generate adaptive cell separated regions wherein the adaptive cell mask having the same component label in the nuclei mask ZOIs is considered as one cell region (**C11, L8-17 describing the use of a watershed algorithm using both the cell mask and nuclei mask to determine cell boundaries**).

Cong does not explicitly disclose the nuclear mask as being labeled with component characteristics. Richards discloses a method of partitioning an image of multiple atoms so that each partition contains one atom in an adaptive manner (**pages 445-450**) using attributes associated with each atom such as atom center and radius (**P441**).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Cong, and modify the partitioning process

to use attributes of each atom, as taught by Richards, thus overcoming prior limitations in the art which counted all atoms as equal, as discussed by Richards (**P449**).

10. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cong and Richards as applied to claim 12 above, and further in view of Hansen.

Regarding claim 14, Cong and Richards discloses the adaptive nuclei region partition calculating cell size estimates (**Cong C2, L57-60; Richards P449**). Cong and Richards do not explicitly disclose using a cell size estimate performed by distance transform and averaging cell distance values within a nucleus for distance metric. Hansen discloses calculating an average distance within a nucleus which may be indicative of cellular size (**C13, L59-66**).

Since Cong and Richards are drawn to methods of segmenting cells using cell attributes, it would have been obvious to one skilled in the art at the time of invention to use the method of calculating cell attributes disclosed by Hanson in the invention of Cong and Richards.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Art Unit: 2624

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric J. Mohr whose telephone number is (571)270-5140. The examiner can normally be reached on 7:30am-5pm M-Th, 7:30am-4pm Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on (571) 272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jingge Wu/
Supervisory Patent Examiner, Art Unit 2624

/Eric J Mohr/
Examiner, Art Unit 2624